DEVELOPMENT OF STEAM-BASED E-MODULES ON HUMAN CIRCULATORY TOPICS CONTAINING CRITICAL REASONING AND INDEPENDENT CHARACTERS

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ABSTRACT

This research aims to develop a STEAM-based e-module containing critical and independent reasoning characters. The method used in this study is Research and Development (R&D). The validation of e-modules is assessed based on three aspects, including aspects of content, construction, and language. The experts who validated each aspect consisted of four experts: three lecturers and one fifth-grade teacher. The practicality test was carried out at Supriyadi Elementary School Semarang Indonesia on 15 students and five teachers. The results of Prisma e-module validation based on content aspects were declared "valid" with a V Aiken value of 0.9615, it is declared "valid" with a value of V Aiken 0.9469 in constructed aspect, and the language aspect is declared "valid" with a value of V Aiken 0.9219. Overall, aspects of Prisma's e-module were declared "valid" with an Aiken V value of 0.942. Prisma's e-module received a practicality test score of 86% from students and 96% from educators. It can be concluded that Prisma's e-module is declared "feasible" and "practical" for use in the learning process. Further research can develop e-modules that can be accessed not only in the Android program but also accessible in the iOS program.

Keywords: Critical reasoning character, e-module, STEAM, human circulatory, independent character.

INTRODUCTION

Massive technological developments require educational institutions to make updates to stay current with the development of the times (Graesser et al., 2020). The acceleration of technology has also led to a shift in new pedagogical models, methods, and strategies of education(Glaze-Crampes, 2020). The shift was driven by the growing disparity between the instruction provided in schools and the needs and interests of learners (Chen et al., 2019). According to Ozdemir & Hekim (2018), Technology devices are an appropriate resource for educational programs. It implies that educators must innovate (Chang et al., 2014). As a manifestation of this innovation, educators need to overhaul conservative learning tools to digital (Hasanudin et al., 2021).

The development of digital devices for the learning process must be adjusted to the competency needs that students must have in the era of Society 5.0 (Romadhianti et al., 2021). Society 5.0 represents a paradigm shift towards an advanced integration of digital technologies with societal needs (Utaminingsih, Ellianawati, Widiarti, et al., 2023), aiming to harmonize economic progress by resolving social challenges through a human-centric approach (Sa et al., 2021). In the context of education, Society 5.0 necessitates a transformative approach that integrates advanced digital technologies into the learning environment,

promoting personalized to equip individuals with the skills and competencies essential for thriving in an inclusive and sustainable future society (Hikmat, 2021).

In response to the need to be helpful in an ever-increasing world of technology, education researchers are considering integrating technology into classrooms (Matsuura & Nakamura, 2021). One of the ways through STEAM (Science, Technology, Engineering, Art, and Mathematics) is a learning technology approach that leads to excellent types of innovation (Perignat & Katz-Buonincontro, 2019). STEAM is the global interest of academics in the worldwide order (Shih-Yun et al., 2022). Referring to these findings, the development of STEAM-based digital devices is considered a solution to challenges in the era of globalization (Kant et al., 2017).

The development of digital learning tools must be adjusted to actual conditions in the field (Ardianti & Wanabuliandari, 2021). It is so that the innovations carried out are appropriate (Hamid et al., 2020). The results of interviews with teachers and students at Supriyadi Elementary School Semarang found that there has been no significant innovation where teachers have not maximized the use of technology for the learning process. The International Society for Technology in Education (ISTE) calls on educational institutions to adapt to the current technological developments (An, 2020) and support the use of digital devices as a means to promote deeper learning by involving learners in the creation of creative technologies (Quigley et al., 2020). Of course, this indicates a gap between the educational process and the demands of learning in the era of globalization. Another problem found is that fifth-grade students have not fully mastered human circulatory material. Students say the material needs to be more challenging to understand. The teacher said that this material is quite complex; besides, there are many foreign terms, so students have not mastered the material thoroughly. In line with these findings, (Utaminingsih, Raharjo, et al., 2023) said that human circulatory material is challenging material for grade V elementary school students to master because the circulatory process material presented requires abstract abilities to understand it.

Elementary school students are in a concrete stage of development, so cognitively, it is still challenging to translate material that requires abstract ideas (Santrock, 2019). They need devices capable of translating abstract ideas into concrete through learning tools (Lu et al., 2022). STEAM is a technology option that can visualize abstract texts and ideas into concrete/tangible forms (Utaminingsih, Ellianawati, Sumartiningsih, et al., 2023). Factual material for students is presented through videos and digital drawings/sketches in digital learning devices (e-modules) (Herro et al., 2018). The STEAM approach provides an engaging learning experience and increases learners' curiosity to explore science more actively (Bilgiler et al., 2020). Various advantages of STEAM include transforming teaching concepts and models based on new technology (Chung et al., 2022) and playing an essential role in improving students' science and technology levels (Chen et al., 2019).

During the interview, the teacher also mentioned that the student's character, critical reasoning, and independence needed improvement. Critical reasoning and independence are two of the six characters in the Pancasila Student Profile (from now on referred to as the Pancasila student character). Pancasila Student Character is a program the government intensifies to build a better national character (Radja et al., 2022). The character of Pancasila students is designed to answer the competencies that the Indonesian education system wants to produce (Kurniawaty et al., 2022), namely the competence to become a democratic Indonesian citizen and a superior, productive human being (Ministry of Education and Culture and Technology, 2022) and character in the era of the 21st century (Utaminingsih, 2023). Implementing this character does not stand alone but merges with learning by incorporating character values (Ernawati et al., 2018).

Critical reasoning guides students to conduct specific and systematic analyses related to problems objectively (Rumtini et al., 2022), carefully distinguish problems, and identify information to plan problem-solving strategies (Badridduja et al., 2022). Reasoning skills are essential for learners to translate the given learning material (Ellianawati et al., 2021). Critical reasoning skills become crucial to teach, instill, grow, and improve (Slam, 2021) So that students can face various problems that occur around them well, skillfully, and critically (Ernawati & Rahmawati, 2022). However, the character of critical reasoning has yet to be optimally developed in the learning process in elementary school (Kibtiyah, 2022).

Independent character directs students to become learners who can understand themselves and the situation at hand as well as the ability to self-regulate (Utaminingsih & Puspita, 2023), which can regulate

thoughts, feelings (Kahf, 2022), and behaviour to achieve their learning and development goals both in the academic and non-academic fields (Ministry of Education and Culture and Technology, 2022). Through the dimensions in the character of Pancasila learners, students are expected to participate in sustainable global development (Jamaludin et al., 2022) and be resilient in various challenges (Sulistiawati et al., 2023). The hope is that the concept answers the challenges of the Indonesian nation in the 21st century in facing the Industrial Revolution 5.0 (Herro et al., 2018) so that the content in the character of Pancasila students is relevant if integrated with e-modules.

Based on the above problems, the solution to overcome these problems is to develop a STEAM-based e-module with human circulatory material that contains critical and independent reasoning characters. The STEAM approach is the right step to choose because STEAM is a bridge between different disciplines (Milara et al., 2020), which offers opportunities for learners to capture various fields of science by learning through pieces of phenomena incorporated into one discipline (Wu et al., 2022). Thus, the character of critical and independent reasoning can be integrated into the topic of human blood circulation.

RESEARCH QUESTIONS

This research aims to develop a STEAM-based e-module on human blood circulation with character, critical reasoning, and independence. The study provided answers to questions such as:

1. What are the characteristics of STEAM-based e-modules on human blood circulation with critical and independent reasoning characters?
2. What is the feasibility of validating STEAM-based e-modules on human circulatory topics containing critical and independent reasoning characters?
3. What is the level of practicality of STEAM-based e-modules on human circulatory topics containing critical and independent reasoning characters?

LITERATURE REVIEW

STEAM

STEAM is conceptualized as a transdisciplinary learning approach (Bertrand & Namukasa, 2020), which refers to the method in which the problem to be solved arises naturally from the questions asked (Choi & Behm-Morawitz, 2017). As a fundamental component in STEAM education, this approach functions to: 1) motivate students in selecting relevant actual problems to be solved, as explained by How & Hung, 2019), and 2) provide various technology options that enable active participation of students through videos, digital images/sketches, visual tools, and collaboration in the context of developing creative solutions to existing problems (Herro et al., 2018). The implementation of STEAM education in the classroom provides an opportunity for learners to understand the importance of the integration of various disciplines and their applications (Tan & Lee, 2022).

Wu et al. (2022) illustrate three approaches that can be used in STEAM education (Silo, Embedded, and Integration). In an embedded disciplinary approach, domain knowledge from at least one discipline is placed in the context of another (Kant et al., 2017). According to Ozkan & Topsakal (2021), applying the STEAM approach is embedded in subjects by choosing one discipline as the parent of several other disciplines (Jesionkowska et al., 2020). Integration with this research on material about human blood circulation, integrated ICT lessons (technological literacy), mathematics (numeracy literacy), cultural arts lessons (art literacy) (Glaze-Crampes, 2020), and there is a content of Pancasila student character in the dimension of critical reasoning (Utaminingsih, Ihsandi, et al., 2023). Essential elements of reasoning are contained in the material, such as efforts to prevent diseases of the lungs, how the heart works, and how to keep the heart healthy. In addition, it is also contained through the navigation process in using the product to be developed and through the evaluation provided (Al-Mutawah et al., 2021). Independent character will automatically be embedded because STEAM is an approach that trains students to be independent (Lin & Tsai, 2021).

Human Circulatory

Human circulatory material is guided by Basic Competence 3.4, which explains circulatory organs and their functions in humans and how to maintain the health of human circulatory organs, and Basic Competence 4.4, which presents works on circulatory organs in humans. Based on research conducted by Sasmito (2022), learners need help understanding the circulatory organs that are interconnected with each other. This is due to the inability of students to reconstruct circulatory system material involving oxygen, the function of the lungs, the number of blood vessels, and the circulatory cycle (Ulfa et al., 2021). Material with high complexity, many organs involved, and a continuous process causes students to need help understanding the material (Sihaloho et al., 2022). It can trigger obstacles in receiving and integrating student knowledge (Nugraha et al., 2020).

Critically Reasoned Character

The third menu in the comments is the character of critical reasoning. Critical reasoning is one dimension of the character of Pancasila students. Students must have a critical reasoning character to build a better national character (Irawati et al., 2022) and to create superior and quality Human Resources (HR). This is contained in the Regulation of the Minister of Education and Culture (Permendikbud) Number 22 of 2020 to create superior human resources and character by determining 6 (six) character dimensions in the Pancasila Student Profile. Indicators of achieving the critical reasoning dimension are poured into 3 (three) elements of critical reasoning: obtaining and processing information and ideas, analyzing and evaluating reasoning, and reflecting thoughts and thinking processes in decision-making. Students are expected to be able to master every element of the critical reasoning dimension so that they can objectively process information both qualitatively and quantitatively, build relationships between various information, analyze data, and evaluate and conclude it.

Independent Character

Efforts to build a superior and quality national character, in addition to critical reasoning character, can also be realized through independent character. Elements of the independent dimension are self-understanding of self and the situation at hand and self-regulation. Students with excellent self-understanding can set self-development goals to their conditions (Kamal & Rochmiyati, 2022). They know of the situation (Jamaludin et al., 2022) and can choose proper strategies for anticipating challenges and obstacles (Uktolseja et al., 2022).

METHOD

The study employed the Research and Development (R&D) methodology (Schwartz et al., 2016). The study was designed with the development of the design-based ADDIE model as its foundational design framework to address the research objectives systematically. According to Gagne et al. (2005), the ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation, facilitated a structured and iterative approach, ensuring a comprehensive exploration of the subject matter. The ADDIE approach enabled the researchers to thoroughly analyze the needs, design the intervention precisely, develop the prototype with attention to detail, implement it in a controlled environment, and meticulously evaluate the outcomes to derive insightful conclusions (Yu et al., 2021). The flowchart design in the study is presented in Figure 1.

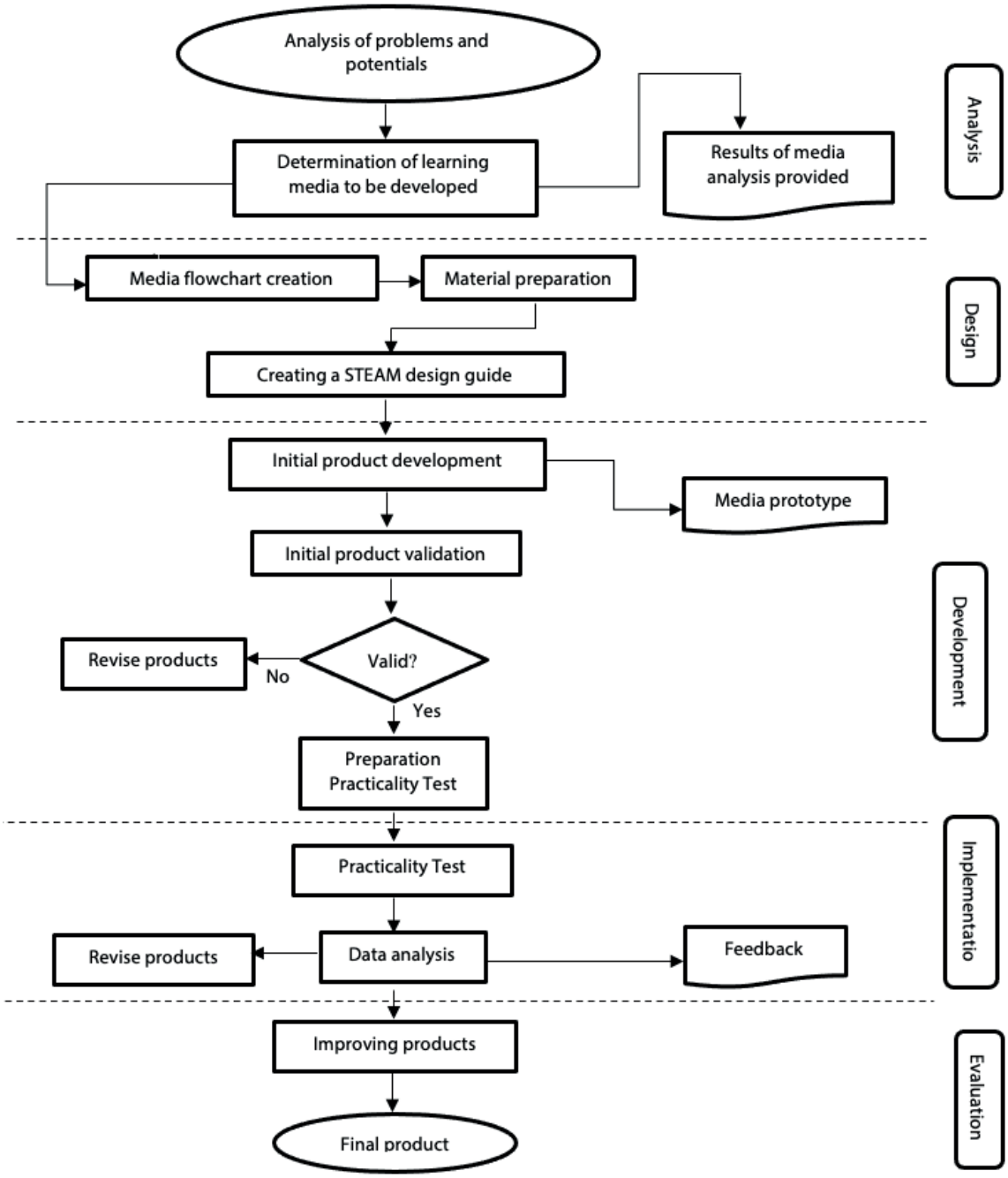

Figure 1. Research Design

ADDIE Research Model

Stage I: Analysis

This stage is an activity to examine or find information related to information sources or data sources and library sources that have relevance to theoretical research. Theoretically, the study is carried out through interviews with educators and students. The information obtained is then summarized and analyzed descriptively to find solutions to get products that suit the needs of students. The interview results found that the material classified as difficult to master by grade V students of Surpiyadi Elementary School Semarang was human circulatory material. Another problem was the character of Pancasila students, the dimension of critical reasoning and independence, still needs to be guided. The next step, a literature review, was carried out to examine solutions that can overcome these problems. Difficulties in the material can be overcome

by visual display, so an e-module that can accommodate visual display was chosen, transforming abstract information into concrete. The development of these e-modules can be inserted with content that can train the science literacy and character of Pancasila students. Through the e-modules that will be developed, the learning process is made as if playing so that it will attract the interest of students and make the learning process feel fun.

Stage II: Design

This stage includes the preparation of the initial design of the practice of STEAM-based e-modules and research procedures for product feasibility tests. Identify the subject matter to be developed by collecting supporting materials and images to obtain a high-quality product draft. Furthermore, the development of e-module products that contain critical and independent reasoning characters. A collection of articles and books relevant to the topic to be developed was obtained from several databases. Material creation begins using PowerPoint software. Furthermore, for the evaluation questions, use the iSpring Suite 10 feature, an additional software for Microsoft PowerPoint. After creating the module, convert the file with presentation format (.ppt) into HTML5 (flash) form using the iSPring Suite ten feature. Furthermore, files can be converted from HTML5 into .apk format or Android applications with Website 2 APK Builder software.

Stage III: Development

The e-module product on the topic of blood circulation containing the character of Pancasila students is made according to the design that has been prepared. Furthermore, expert validation is carried out, including material validation, media validation, and language validation. Material expert validation aims to obtain data in the form of assessments, opinions, criticisms, and suggestions on the accuracy and suitability of material in developing STEAM-based e-modules containing critical and independent reasoning characters so that the scientific truth of the module becomes more reliable. Media validation aims to obtain data from assessments, opinions, criticisms, and suggestions on the appearance and preparation of STEAM-based e-module development. Linguist validation to assess language usage suitability, suitable and excellent language clarity, and e-module readability.

Test the validation using the prepared validation sheet. The first stage of product revision is based on the results of material expert validation tests, including the relevance of teaching materials, consistency, and depth of teaching material substance. The validation test by media experts consists of qualitative data related to presentation structure, graphics, presentation order, module content, how to organize it, display of module activities, involvement in student activities, general appearance, digestibility of the module, attention to the code of ethics, and copyright. Linguist validation tests include data on the suitability of the language used and readability of e-modules. Product design revisions refer to expert advice but still consider field conditions. If the results are invalid, it is an invalid revision, but if it has been continued with trials in small groups.

Stage IV: Implementation

Small group tests were conducted on students and educators as test subjects to collect qualitative data on the readability aspects of STEAM-based e-modules containing science literacy and Pancasila students. The readability test aims to determine the shortcomings in the e-module, such as misprints, typefaces, image layout errors, and others, as well as assess the clarity of the contents of the e-module, ease of understanding the contents of the module, attractive appearance, and readability of the e-module. Small group tests using instruments in the form of questionnaires to determine student responses to the STEAM-based e-modules applied.

Stage V: Evaluation

Analysis of small-scale test results is carried out to improve e-modules to be more suitable for the learning process on large-scale tests. Improvement refers to the effects of teacher and student response questionnaires. After the revision, the product is registered with the Ministry of Law and Human Rights to obtain a copyright.

Participants

This research was held for ten weeks, starting from interviews with teachers and students at Supriyadi 01 Elementary School Semarang, e-module development, content expert validation, construct expert validation, linguist validation, and revision of improvements according to expert advice, to practicality tests and product copyright submissions. The interview was conducted at Supriyadi Elementary School Semarang Indonesia with 2 (two) grade V teachers and 5 (five) grade V elementary schools. The research is implemented in the even semester of the 2022/2023 academic year. Development of e-modules received suggestions and input from supervisors. Each assessment aspect, from content to language, has three experts to validate. Content and construct experts consist of three lecturers and one fifth-grade teacher, and linguists consist of two lecturers and two teachers of fifth grade E-modules after completion are validated and improved according to expert advice, then tested practicality to 15 grade V students at Elementary School Supriyadi Semarang. The 15 learners are homogeneous. In addition, practicality tests were conducted on 5 (five) grade V Supriyadi Elementary School Semarang teachers.

Data Collection Instruments

Data collection instruments for expert validation, each of which includes indicators to be assessed. The scale used in the expert validation instrument consists of five scales, from "very non-conforming," which is given a score of "1," to "very conforming," which is given a score of "5." Media expert validation assessment consists of two aspects: content and presentation feasibility. Further recognizing content expert validation instruments are presented in Table 1.

Table 1. Content Expert Validation Instrument Grid

Number	Feasibility	Indicators
1.	Content Eligibility	Material suitability
		Accuracy of the material
		Material up-to-date
		The character of Pancasila Students
2.	Eligibility of Presentation	Serving technique
		Presentation of Learning

The media expert validation assessment consists of five aspects. The grid of media expert validation instruments is presented in Table 2.

Table 2. Media Expert Validation Instrument Grid

1.	Completeness of E-Modules	Attractive cover and title according to the content
		Complete introduction, table of contents, and instructions for use
		Completeness of videos, supporting links of materials and images
2.	Eligibility of Presentation	Ease of access to e-modules
		How-to page makes it easy to use
		Systematics of presentation
		Easy page search setup
		Easy sharing of e-modules
3.	Software	Ease of operation
		Ease of media management
4.	Consistency	Menu layout consistency
		Consistency of letter shape and size
		Layout consistency

5.	Graphics	Use of font size and type
		Layout
		Page format
		Image clarity
		Video clarity
		Coloring
		Design appears

The assessment aspect of media expert validation consists of 5 (five) elements. More about its aspects and indicators are presented in Table 3.

Table 3. Linguist Validation Instrument Grid

Number	Assessment Aspect	Indicators
1.	Businesslike	Sentence structure accuracy
		Sentence effectiveness
		Standards of terms
2.	Communicative	Facilitate understanding of information
3.	Dialogical and interactive	Motivate students
		Encourage learners to think critically.
4.	Suitability to learner development	Compatibility with intellectual development
		Compatibility with the emotional level
5.	Compliance with language rules	Grammatical accuracy
		Spelling accuracy
6.	Use of terms, symbols, or icons	Proper use of terms
		Proper use of symbols or icons

The e-module practicality data collection instrument is provided to teachers and students. In the teacher practicality instrument, teachers are asked to put a "checklist" mark on the items supplied if the indicators in the questionnaire are by the e-module. The grid of the teacher's practicality instrument is presented in Table 4.

Table 4. Teacher Practicality Test Grid

1.	Cover Page	Attractive cover color
		The image on the cover is transparent.
		The right color combination
		Describe the contents of the module.
2.	Table Clarity / Illustrations / Images	Clear tables/illustrations/drawings
		Tables/illustrations/figures according to the material
		Table/illustration/figure with captions
		Table/illustration/figure with source
3.	Language and Sentences	Language, according to EYD
		Language has a clear intent.
		Communicative sentences
		Effective sentences
4.	Clarity of Writing	Font appropriate
		No typos
		Follow the rules of the EYD.
		The writing can be read clearly.

5.	Color Composition	Attractive colors
		Color composition is not superfluous.
		Vivid and non-opaque colors
		Balanced colors
6.	Use of terms, symbols, or icons	Encouraging material problems-solving
		Practice questions according to the material
		Evaluation test at the end of the module
		Tables and figures are easy to understand
7.	Motivating to Respond to Learning	Fostering an interest in reading
		Encourage students to learn.
		Encourage students to think critically.
		Fostering a sense of enthusiasm for learning

Unlike the teacher practicality questionnaire, the student practicality questionnaire is packaged using language by the language used or easily understood by students. The scale used was only four times, from "strongly disagree" with a score of "1" to "agree" with a score of "4". The grid of instruments of practicality of learners is presented in Table 5.

Table 5. Student Practicality Instrument Grille

1.	Effectiveness	a. Clear study instructions
		b. Clear practice instructions
		c. The e-module is easy to use
2.	Efficiency	a. Material according to the topic of human blood circulation
		b. The material is presented in order
		c. Complete, straightforward and easy-to-understand material
3.	Creativeness	a. Attractive cover color
		b. Clear and sharp images
		c. Interesting background
4.	Readability	a. Font and size are legible
		b. No typos
		c. Language is easy to understand
5.	Interactive	a. Fostering an interest in reading
		b Motivate students to learn
		c. There are tests

Data Analysis

Validity of E-Module Content

Testing the validity of the content is carried out by experts (expert judgment) (Sugiyono, 2015). Specification tables are prepared for context experts to measure their adequacy and compatibility with test items (Zulyusri et al., 2017). The calculation of content validity uses Aiken's V equation to calculate the Content-Validity Coefficient (CVI) based on the results of several validators' assessments of the item. Content validity analysis is carried out by comparing the developed e-module assessment instrument with the instrument grid. Experts

assess material (content), media (construct), and language aspects. Aiken formulated Aiken's V formula for calculating the content-validity coefficient based on an expert panel's assessment of "n" people on an item. The extent to which the item represents the measured construct. The evaluation is carried out by marking a checklist from the category "Not Suitable" with a score of "1" to "Very Conforming" with a score of "5." Aiken's V formula is presented in Eq.1.

$$V = \frac{\Sigma S}{[n(c-1)]} \qquad \text{(Eq. 1)}$$

Information:

S = r – lo

r = number given by the appraiser

lo = lowest validity assessment number

n = number of appraisers

c = highest validity assessment number

According to Aiken (1985), determining the validity of each item assessed can be analyzed by looking at the value of the validity coefficient V contained in the Validity Coefficient Value Table presented in Table 6.

Table 6. Value of Validity Coefficient (Aiken, 1985)

Raters	Number of Twigs Categories							
	2		3		4		5	
	V	P	V	P	V	P	V	P
2							1	0,040
3							1	0,008
3			1,00	0,037	1	0,016	0,92	0,032
4					1	0,004	0,92	0,032
4			1,00	0,012	0,92	0,020	**0,88**	0,024
5			1,00	0,004	0,93	0,006	0,90	0,007
5	1,00	0,031	0,90	0,025	0,87	0,021	0,80	0,040

The study sets the p-value < 0.05, and then the second row sees each number of raters. The number of raters is four experts, and the questionnaire scale used is five scales. Therefore, this study's content validity analysis results are guided by the fourth rater's column with $p < 0.05$ in the second row and the number of twigs categories (scale) in the fifth column of 0.88. In addition, the level of validity analyzed by Aiken's equation should refer to the Kappa Statistic validity classification category. Kappa statistic or interrater reliability was a measure used to test agreement between two people (raters) on categorical variables. The technique was used by some researchers, such as Wynd et al. (2003), which uses CVI and kappa multi-rater to validate the scale content it develops. Kappa Statistics is an important supplement but not a substitute for CVI. Kappa provides information about the extent of the deal beyond the possibilities (Polit & Beck, 2006). If there are more than two raters, the Kappa multi-rater technique can be used. The statistical measure of interrater reliability is Kappa Cohen, which ranges from 0 to 1.0, where large numbers mean better reliability. Landis & Koch (1977) provides assessment guidelines on the Kappa statistics presented in Table 7.

Table 7. Kappa Statistic Assessment Guidelines (Landis & Koch, 1977)

Kappa	Interpretation
< 0	Poor Agreement
0.00 – 0.20	Slight Agreement
0.21 – 0.40	Fair Agreement
0.41 – 0.60	Moderate Agreement
0.61 - 0.80	Substantial Agreement
0.81 – 1.00	Almost perfect Agreement

E-Module Practicality Test

The e-module practicality test was analyzed by summing the scores of all indicators in each aspect of all respondents so that the final value of each aspect can be known. Further, the absolute value was calculated using the formula presented in Eq. 2.

$$P=\frac{f}{N}\times 100\% \qquad \text{(Eq. 2)}$$

Information:

P = final value

F = Score acquisition

N = maximum score

The category is carried out after the final score is obtained according to the value received. The types of practicality values are presented in Table 8.

Table 8. Practicality Category (Cahyadi, 2019)

Value (%)	Category
80 < x ≤ 100	Very practical
60 < x ≤ 80	Practical
40 < x ≤ 60	Practical Enough
20 < x ≤ 40	Less Practical
0 < x ≤ 20	Not Practical

FINDINGS AND DISCUSSIONS

E-Module Development Results

The development of the Prisma e-module was facilitated by employing diverse software tools, including Microsoft PowerPoint (.ppt), the iSpring Suite 10 functionality within Microsoft PowerPoint (.ppt), and the Website 2 APK Builder application. Microsoft PowerPoint was chosen as the leading software to develop e-modules because Microsoft PowerPoint is a computer program that can be run well on PC/Laptop Based on Windows and also Apple Macintosh, which uses Apple Mac OS. This software is almost available on all educators' PCs/laptops. Microsoft PowerPoint is also easy to operate, so it is an environmentally friendly tool and easy to use in development. The material was developed and compiled in Microsoft PowerPoint. Furthermore, the iSpring Suite 10 feature of Microsoft PowerPoint was used to make evaluations or quizzes. Another use of iSpring Suite 10 was that after the material and examination have been compiled, this feature has a function to convert files with presentation format (.ppt) into HTML5 (flash). Files converted into HTML5 (flash) and then converted into .apk format or Android applications with Website 2 APK Builder software.

E-modules are arranged systematically within two months and designed by the developer to control the content learned because they can adjust to the planned curriculum (Hamid et al., 2020; Komikesari et al., 2020). According to Accraf et al. (2019), e-modules are interactive, allowing easy transitions of learning content because they can accommodate audiovisual media and animations (Andriani et al., 2021). In addition, the e-module is also equipped with practice questions and evaluation questions so that educators can find out the results of learning and increase the competencies and dimensions measured (Ilmi et al., 2021; Rasmussen et al., 2020).

The development of the Prisma e-module was an effort to improve the character of Pancasila students in critical reasoning and independence. Nursalam & Suardi (2022) explained that the e-module is one of the means to enhance the character of Pancasila students in the critical reasoning dimension. It is supported by the findings of Pinontoan et al. (2021) that the learning process supported by e-modules will improve students' reasoning skills. Setiawan et al. (2022) also said that e-modules can improve the critical reasoning ability of elementary school students. Prisma's e-modules was designed to make learners more interested in learning independently. The e-module was intended for students to learn more actively to develop their potential (Dhillon & Murray, 2021) so that learners will increasingly be trained independently to exercise self-control in the learning process so that they can learn and solve problems in their own way (Wasiluk et al., 2022).

E-Module Characteristics

The design of e-modules carefully considers distinctive features to fulfil educational goals. Ideally, the Prisma e-module would be integrated into the instructional process on six occasions. During each session, the pedagogical intent is to cultivate aspects of the Pancasila student persona, specifically fostering critical reasoning and independence. A list of activities for each meeting is presented in Table 9.

Table 9. List of Activities for Each Meeting

I	Circulatory 1. The Role of Blood 2. Circulatory System 3. Great Circulatory 4. Small Blood Circulation 5. Differences between Arteries and Veins 6. Video Playback 1 and 2 (Human Circulatory System)	1. Critical Reasoning Element: a. Acquire and process information and ideas. b. Reflect and evaluate his thoughts. 2. Self-sufficient Element: Self-regulation
II	Heart 1. Heart Section 2. Heart Size and Location 3. Heart Function 4. Video Playback 3 (Heart) and 4 (Heart and Circulatory)	1. Critical Reasoning Element: a. Acquire and process information and ideas. b. Analyze and evaluate reasoning c. Reflect and evaluate his thoughts. 2. Self-sufficient Element: Self-regulation
III	Heart 1. Heart Disease 2. How to Keep Your Heart Healthy 3. Video Playback 4 (How to Maintain Circulatory Organs) and Video 5 4. Technology for the heart	3. Critical Reasoning Element: a. Acquire and process information and ideas. b. Analyze and evaluate reasoning c. Reflect and evaluate his thoughts. 4. Self-sufficient Element: a. Self-understanding and the situation at hand b. Self-regulation

IV	Vein	1. Critical Reasoning Element: a. Acquire and process information and ideas. b. Analyze and evaluate reasoning c. Reflect and evaluate his thoughts. 2. Self-sufficient Element: Self-regulation
V	1. Lung Material and Video Playback 6 2. Creating Mind-Mapping	1. Critical Reasoning Element: a. Acquire and process information and ideas. b. Analyze and evaluate reasoning c. Reflect and evaluate his thoughts. 2. Self-sufficient Element: Self-regulation
VI	Replay of All Videos and Practice Questions	All characters reason critically and independently, and their elements

Quoting from Chaira & Hardeli (2022), an e-module is an Information and Communication Technology (ICT)-based module that contains material and evaluations that are arranged systematically and interestingly, are interactive and independent, and provide feedback through formative tests or quizzes presented. Referring to this statement, the characteristics contained in the Prisma e-module include several components, including 1) Comments (competencies and dimensions); 2) Rambu (study summary for you), which contains the entire material to be taught; 3) Vijar (learning video); 4) Sequizi (a set of core quizzes); and 5) Infi (information about the author and source material). The menu of the Prisma e-module is presented in Figure 2.

Figure 2. Home (Main Menu) of Prisma E-module

"Komen" Menu (Competencies and Dimensions)

The Comments menu in the Prisma application consists of core competencies, essential competencies, and the character of Pancasila students. The Comments menu in the Prisma e-module is presented in Figure 3.

Figure 3. Comments Menu from Prisma E-module

The inclusion of IC and BC on human circulatory material in the menu that has been prepared adapts to the curriculum for the current fifth grade. It is also intended so that students know the competencies that must be achieved to master concepts. In this research, although the goal is not to master the concept, students still have to know the learning objectives that must be achieved. Considering the results of previous interviews both with students and with educators, it was found that the human circulatory material is material that is quite difficult to master, as evidenced by the results of the evaluation of the material, which showed that 17 (seventeen) out of 31 (thirty-one) students had not Complete when evaluating the material. It indicates that more than 50% of students have yet to reach the minimum completeness criteria in the evaluation process, so mastery of concepts about human circulatory material cannot be categorized as being able to be mastered by students.

Rambu (Study Summary for You)

Menu Signs on the e-module is an acronym for learning summary for you. Signs contain all material about human blood circulation, starting from the general circulatory menu, heart and lung organs, and blood vessels. The Signs menu display in the Prisma e-module is presented in Figure 4.

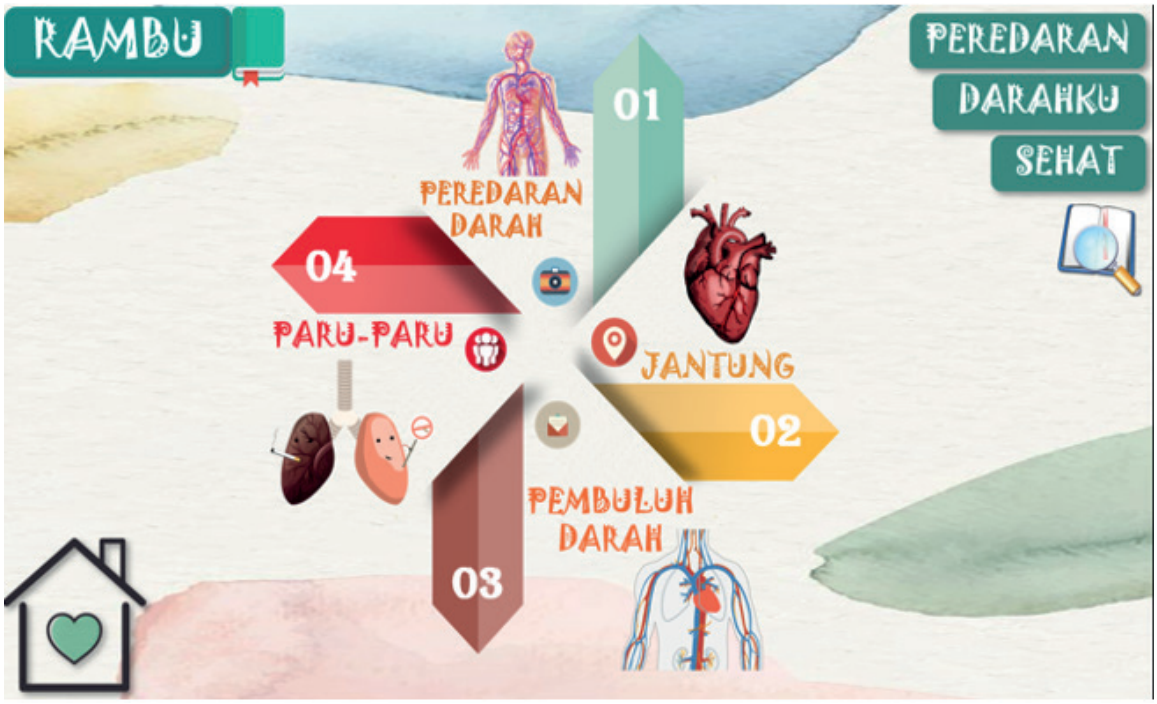

Figure 4. Rambu Menu in Prisma E-Module

The material was adjusted to the measured element. The material was designed to be as attractive as possible to motivate students to learn. The material presented was combined with images, both authentic images and illustrative images. The purpose of using images is to clarify the material presented. It follows the theory developed by Santrock (2019) that children of primary school age are in a concrete stage. The presentation of the material should involve concrete images to capture the explanation given (Meriyati, 2015). Images can lead to understanding abstract ideas by visualizing verbally and symbolically (Saepudin, 2018). Through the pictures presented by students, it is easier to convert the information obtained because explanations accompanied by visual media make explanations easy to absorb and sharpen understanding (Widiastika et al., 2020).

The material in the e-module was not only presented in the form of images but the delivery of information was also presented in the form of tables to group information to make it more concise and easier to understand. Explanations in text form are also given briefly with efficient sentences to make it easier for learners to understand the explanation of the text presented. It aligns with the findings of Irawan et al. (2021) that elementary school-age students are interested in reading short and clear sentences. Referring to these findings, the text in this e-module is presented briefly with efficient and easy-to-understand sentences. In the Rambu menu, in addition to offering explanations in text form, there was also a voice feature that contained descriptions of the material presented on several pages that needed detailed explanations. The feature is helpful as it offers a variety of options and sharpens explanations. Students needing more interest in reading can still get information through the voice features presented.

The STEAM approach to the presentation of concepts was carried out embedded; namely, the material was based on human blood circulation, and then material to sharpen the concept of Pancasila student character was inserted into the material. The material presented is aimed at mastery of concepts, critical reasoning character, and independent character. The material for mastering concepts was adjusted to the material in the textbook used by educators in Supriyadi Elementary School Semarang. However, material from several books and journals was added to sharpen the information provided. The material presented was adjusted to the elements to be measured and accompanied by case examples. The illustrated case examples were connected with everyday life. Students are expected to capture concrete information through the case examples presented and then connect with the surrounding cases. The hope is that through learning the habituation of the case examples given, they have enough provisions and the ability to receive information well, draw conclusions, and solve problems.

Pancasila student character material was presented based on elements following the critical reasoning dimension: obtaining and processing information and ideas, analyzing and evaluating reasoning, and reflecting on thoughts and thought processes in decision-making. The output of the data presented in the Rambu menu, the elements of critical reasoning, can be mastered by students. The primary key to developing learning materials that contain the character of Pancasila students is to attract student involvement in learning and create a pleasant learning atmosphere so that students can learn based on experiences in everyday life that are integrated with the knowledge that has been obtained (Hidayati & Julianto, 2018). Referring to this statement, the material development in this e-module was prepared by including moving images and animations so that students would focus more on the material. It was also conveyed by Nugraha et al. (2020) that moving pictures or animations will help learners focus.

The concept of material development in the Prisma e-module also directs learners to sharpen their understanding of concepts. Furthermore, students can solve various problems in everyday life by drawing conclusions based on scientific evidence. It follows the expected concept of critical reasoning. After exploring the material in the e-module, students can develop an understanding of the material learned in a conceptual scheme. Then, they relate the schema to their general knowledge of procedural skills and use that understanding to solve scientific problems (Azimi et al., 2017).

The elements of the independent dimension consist of awareness of self and the situation at hand as well as self-regulation (Jamaludin et al., 2022). Material about independent character elements was also integrated into healthy circulatory material, such as how to keep the heart healthy, a healthy lifestyle, and knowing the typical number of heartbeats and healthy lung capacity. Independent characters are also automatically integrated into students through Prisma e-modules that run on smartphones. Prisma e-module was designed with many navigation buttons, which direct students to work independently. It aligns with what was conveyed by Mikuteit et al. (2020) and Ilmi et al. (2021) that the development of e-modules that include navigation buttons in menu directions will train the independence of learners. The navigation buttons in the developed e-module also direct students to find, formulate, identify, analyze information, arrive at strategizing, and solve problems. Based on the explanation above, the Prisma e-module guides students to have critical reasoning and independent character.

Vijar (Learning Video)

The Vijar menu in the e-module contains several videos about the human circulatory system, how the heart works, how to maintain the circulatory organs, the dangers of smoking, and the dangers of cholesterol. The menu of learning videos in the Prisma e-module is presented in Figure 5.

Figure 5. Vijar Menu in Prisma E-Module

Video is an audio-visual media that combines images, text, sound, music, and animated images in one unit (Nugraha et al., 2020). Through learning videos, educators can create a learning atmosphere that is not monotonous (Norma, 2021). Learning videos can help educators teach concepts from the material and explain abstract things in concrete because they present complex information in text, images, and sound (Widiarti et al., 2021). Videos can visualize challenging material to convey through verbal or conventional props (Novita et al., 2019). The purpose of presenting the learning video menu in this e-module is to make transferring information to students easier to convey. Learning videos explain new things to attract students' attention and focus more on learning (Busyaeri et al., 2016; Widiarti et al., 2021). Students also become more motivated to explore information or search for knowledge to explore the material (Wardani & Syofyan, 2018). Referring to this, learning videos can train students' learning independence to support the deepening of the material, and learning objectives can be achieved.

The use of video in learning is an effective way to help students relate the competencies they have mastered to their environment in everyday life (Hapsari & Zulherman, 2021). The video presented directs students to have a critical reasoning character. The information presented in the video can lead learners to process information and ideas, analyze reasoning, and evaluate their thoughts. It is supported by the findings by Suminar (2022) that the application of video in the learning process can improve students' critical reasoning skills. In line with the statement, Windfall et al. (2022) convey that audiovisual media can improve the critical reasoning ability of elementary school students.

Sequizi (Core Quiz Set)

The fourth menu in the e-module, Sequizi, contains quizzes or evaluations. Sequizi is an evaluation stage after the information transfer process through the material presented in the Rambu and Vijar menus. Evaluation of learning outcomes is one of the core (which must be present) of the e-module. The preparation of e-modules needs feedback to measure the level of mastery of the material or the success of students (Asmiyunda et al., 2018). Thus, the evaluation section of the e-module is essential for the independent learning process, which is helpful as a measure of students' learning development (Yanuarti et al., 2022).

The evaluation in the Sequizi menu consists of 3 (three) choices: quiz A, quiz B, and quiz C. Quiz A contains questions about understanding concepts. Quiz B has character training questions, critical reasoning, and independence. Quiz C also contains final evaluation questions for characters with critical and independent reasoning. Quizs B and C look almost identical, but each question item differs. Quiz B can be accessed by disseminating the product to students (initial use). In contrast, quiz C cannot be accessed during the learning process because it was used to measure the character of Pancasila students through pretest and posttest so that quiz C can be accessed when the research process is complete. The Sequizi menu on the Prisma e-module is presented in Figure 6.

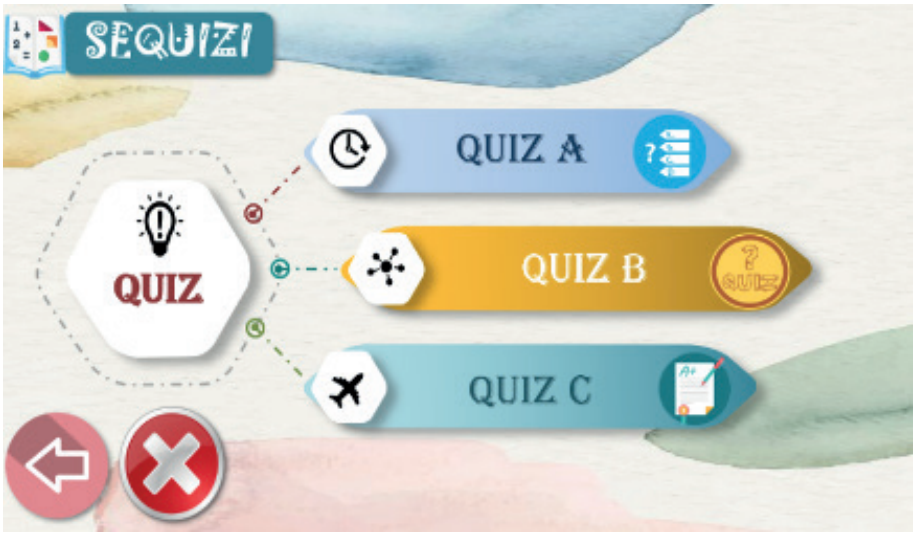

Figure 6. Sequizi Menu in Prisma E-Module

Infi (Information about the Author and Source of the Material)

The fifth menu of the main menu in the Prisma e-module is the Infi menu, an acronym for Information. This menu contains the Prisma e-module developer profile information, application usage instructions (Prisma e-module), reference materials, video and image references, and a glossary. The Infi menu display in the e-module is presented in Figure 7.

Figure 7. Infi Menu in E-Module

The developer profile consists of a researcher profile and a supervisor profile. The developer profile contains a brief curriculum vitae of researchers and supervisors, and there is a developer e-mail address whose function makes it easier for users (educators and students) who want to contact the developer or have questions related to the e-module. The application instructions are intended to make it easier for students to operate the Prisma e-module. There are buttons and instructions and an explanation of the instructions for use. The reference material contains the sources of material used in compiling the Rambu menu. Reference material from books, national journals, and international journals. Citations or references to material were included to appreciate the work of other authors and avoid plagiarism. In addition to material references, video and image references (including navigation button images) were also embedded in the menu so that the video and image sources used in developing the e-module are listed to appreciate the work of video and image creators and avoid plagiarism.

The Glossary menu was intended to make it easier for students to understand words that are difficult to understand or foreign words for students. There was information that explains difficult words/foreign words so that after reading the Glossary, students easily understand words that are considered foreign/words that do not understand their meaning. Students are expected to absorb the material presented more efficiently through the Glossary.

Feasibility of the Prisma E-Module Charged with Critical Reasoning and Independent Characters

The feasibility analysis of the Prisma e-module was obtained through expert validation and practicality test assessments. The feasibility assessment is carried out by expert validation of the Prisma e-module that has been developed. Expert validation consists of lecturers who are competent in their fields and grade V elementary school educators. The assessment of practicality test of the e-module was tested for grade V educators and grade V students of Supriyadi Elementary School Semarang. The design of the Prisma e-module assessment instrument that the supervisor has approved was then submitted for assessment by

expert validation. The expert validation assessment of the Prisma e-module was divided into 3 (three), namely material expert validation (content), media expert validation (construct), and linguist validation. Each expert validation consists of four validators.

Material Expert Validation Results (Content)

Material expert validation consists of 3 (three) lecturers and 1 (one) grade V elementary school teacher. Lecturers who become validators of material (content) are lecturers who have competence in research topics. Content validators have competence in health and education at the same time, as expert lecturers in the field of natural sciences. In contrast, the teacher who became the material validator was a fifth-grade teacher with experience developing teaching materials. As a material expert, the teacher also assesses the limits of human circulatory material for fifth-grade students. The results of Prisma e-module material validation by material expert validation are presented in Table 10.

Table 10. Prisma E-Module Material Expert Validation Results

Item	V value	CVI Aiken	Category Validity Status
1	0,9375	Valid	Almost Perfect
2	0,9375	Valid	Almost Perfect
3	1	Valid	Almost Perfect
4	0,9375	Valid	Almost Perfect
5	0,9375	Valid	Almost Perfect
6	0,9375	Valid	Almost Perfect
7	0,9375	Valid	Almost Perfect
8	1	Valid	Almost Perfect
9	1	Valid	Almost Perfect
10	0,9375	Valid	Almost Perfect
11	0,9375	Valid	Almost Perfect
12	1	Valid	Almost Perfect
13	1	Valid	Almost Perfect
Final V Value	0,9615	Valid	Almost Perfect

Table 10 shows that material expert validation of the Prism e-module obtained a final V value of 0.9615. The results are then reviewed from the value of Aiken's validity coefficient with the number of raters or raters as many as 4 (four) experts and 5 (five) questionnaire scales, with a value of $p < 0.05$. The results of the validity level analysis with Aiken's equation as a whole aspect, the value of V 0.91615, is included in the "valid" category. When reviewed per item, all items are declared "valid" according to the CVI table. Kappa Statistics is another reference used to categorize a product's validity (Polit et al., 2007), and according to assessment guidelines on Kappa Statistics Landis & Koch (1977), Strictly allowed. Based on these results, the Prisma e-module has met the minimum assessment to determine the feasibility of the product from the material aspect (content), according to the Aiken and Kappa Statistical equations. Therefore, the Prisma e-module is declared feasible from material (content).

Media Expert Validation Results

Validation of media experts have competence in graphic design consisting of computer experts and experienced in the world of Education. Media validators are given an assessment grid and validation assessment form to determine the validity of Prisma e-module products from the media aspect, which consists of 3 (three) lecturers and 1 (one) grade V elementary school teacher. Lecturers and teacher who became the Prisma e-module validators had experience in developing learning media for grade V elementary schools. The

validity of the content is quantitatively analyzed using the equations proposed by Aiken. The results of the validation of Prisma e-module material by media expert validation are presented in Table 11.

Table 11. Results of Media Expert Validation Prisma E-Module

Item	V value	CVI Aiken	Category Validity Status
1	0.9375	Valid	Almost Perfect
2	1	Valid	Almost Perfect
3	0.9375	Valid	Almost Perfect
4	0.9375	Valid	Almost Perfect
5	0.9375	Valid	Almost Perfect
6	0.9375	Valid	Almost Perfect
7	1	Valid	Almost Perfect
8	0.9375	Valid	Almost Perfect
9	0.9375	Valid	Almost Perfect
10	0.875	Invalid	Almost Perfect
11	1	Valid	Almost Perfect
12	0.875	Invalid	Almost Perfect
13	0.9375	Valid	Almost Perfect
14	0,875	Invalid	Almost Perfect
15	1	Valid	Almost Perfect
16	0.9375	Valid	Almost Perfect
17	1	Valid	Almost Perfect
18	1	Valid	Almost Perfect
19	0.875	Invalid	Almost Perfect
20	1	Valid	Almost Perfect
Final V Value	0.9469	Valid	Almost Perfect

Table 11 shows the results of media expert validation of the Prisma e-module, which obtained a final V value of 0.9469. When viewed from all aspects, based on the value of Aiken's validity coefficient, with the number of raters 4 (four) raters and 5 (five) questionnaire scales used with $p<0.05$, the results of the validity level analysis with Aiken's equation, show that the Prism e-module from the assessment of media experts is declared "valid." If analyzed per item based on the CVI table, the media expert validation results were four items declared "invalid" with a 0.875 V score. These items are contained in user-friendliness, consistency, and graphics. The item stated invalid according to the CVI table is "The software is easy to access, and the links are easy to share with learners," the following item is "The use of shapes and letters is consistent, simple, attractive, and easy to read," then on the graphic aspect consisting of two items "font size and type according to standards and easy to read" and "the combination of colors used contrasts so that the writing in the e-module can be read." On the other hand, another reference categorizes the V value of 0.875 into the "almost perfect" category, namely the Kappa Statistics reference (Landis & Koch, 1977). The results of the analysis from the authority of CVI Aiken and Kappa Statistic show that the Prisma e-module has met the minimum assessment to be declared feasible from the aspect of media (construct).

Linguist Validation Results

Linguist validation to assess the accuracy of language grammar use, language clarity used, language suitability with the age of the research subject, the efficiency of sentences used, and the overall readability of the e-module. Linguist validation for the feasibility assessment of the language used consists of 4 validators: two Indonesian lecturers and two Indonesian teachers. The validity of the content was quantitatively analyzed using the equation proposed by Aiken. The results of Prisma e-module language validation by linguist validation are presented in Table 12.

Table 12. Prisma E-Module Linguist Validation Results

Item	V value	CVI Aiken	Category Validity Status
1	0.9375	Valid	Almost Perfect
2	0.9375	Valid	Almost Perfect
3	0.875	Invalid	Almost Perfect
4	0.875	Invalid	Almost Perfect
5	0.9375	Valid	Almost Perfect
6	0.9375	Valid	Almost Perfect
7	0.9375	Valid	Almost Perfect
8	0.9375	Valid	Almost Perfect
9	0.9375	Valid	Almost Perfect
10	0.9375	Valid	Almost Perfect
11	0.875	Invalid	Almost Perfect
12	0.9375	Valid	Almost Perfect
Final V Value	0.9219	Valid	Almost Perfect

Based on Tabel 12, the result of linguist validation of the Prisma e-module obtained a final V value of 0.9271. By analysis of Aiken's CVI Value with the number of four experts and the questionnaire scale used, there were five scales with $p<0.005$. Prisma e-module language validation results were declared "valid." If each item is assesed, three items were declared "invalid." It was still permitted by Kappa Statistics referrals (Landis & Koch, 1977), which categorizes 0.875 into the "near-perfect" category, so a V value of 0.875 is still acceptable. Based on the results of these categories, the Prisma e-module has met the minimum assessment for product feasibility from the language aspect.

Validation Results of All Aspects

Based on the results of the content validity analysis test from the validation of material experts, media experts, and linguists, the scores of the three aspects were averaged to determine the final validity value of the Prisma e-module. The results of the validity analysis test on all elements are presented in Table 13.

Table 13. Results of Validation of All Aspects

Validation Team	
Aspects	V value
Material	0,9615
Media	0,9469
Language	0,9219
Average	0,9434
Category	Valid

Table 13 shows that in the analysis of product validity in terms of material validation, media, and language, or all aspects, Prisma e-modules were declared "valid" so that it is suitable for use. These results align with the findings of Amalia et al. (2021) that the e-module developed was declared "valid," with a percentage gain of 92.68%. In detail, thePrisma e-module obtained an aspect score of 94.17% on the language aspect, the content aspect of the student module obtained a score of 91.67%, the criteria were very valid, and the presentation aspect received a 92.59%.

The e-module developed must be declared "valid" by experts with competence in the topic developed and researched so that the product is suitable for use in the learning process, significantly improving the character of critical and independent reasoning. In line with these findings, Rohmaini et al. (2020) state that module development must obtain appropriate criteria from experts before disseminating and using it in the learning process. Rofiyadi & Handayani (2021) added that before e-modules are used in class, e-modules should

be declared "valid" according to improvements from experts so that students would be interested in using the e-module. The e-module are feasible, attractive, and cause curiosity to motivate students to dig deeper into the continuation of the knowledge being learned (UZ et al., 2019). It has implications for achieving learning objectives (Accraf et al., 2019).

Improvements from Expert Validation

Product feasibility assessment assesses material, media, and language expert validation results. According to Bakhtiar (2018), the expert review aims to discover the shortcomings of the developed product and get constructive suggestions for improving the developed product. Annisa & Simbolon (2018) add the expert assessment to identify product deficiencies from the effect development, which is then followed by suggestions for improvement so that the product that has been developed follows learning objectives and is suitable for use in learning.

Improvements from Material Expert Validation

The first assessment was from material expert validation. Based on the validation that material experts on Prisma e-modules have carried out, suggestions were obtained for product improvements so that e-modules become better and more feasible. Suggestions for improving the e-module are to use scientific words in the image captions of the circulatory system and parts of the heart and complete the heart function material. Such improvements are presented in Figure 8.

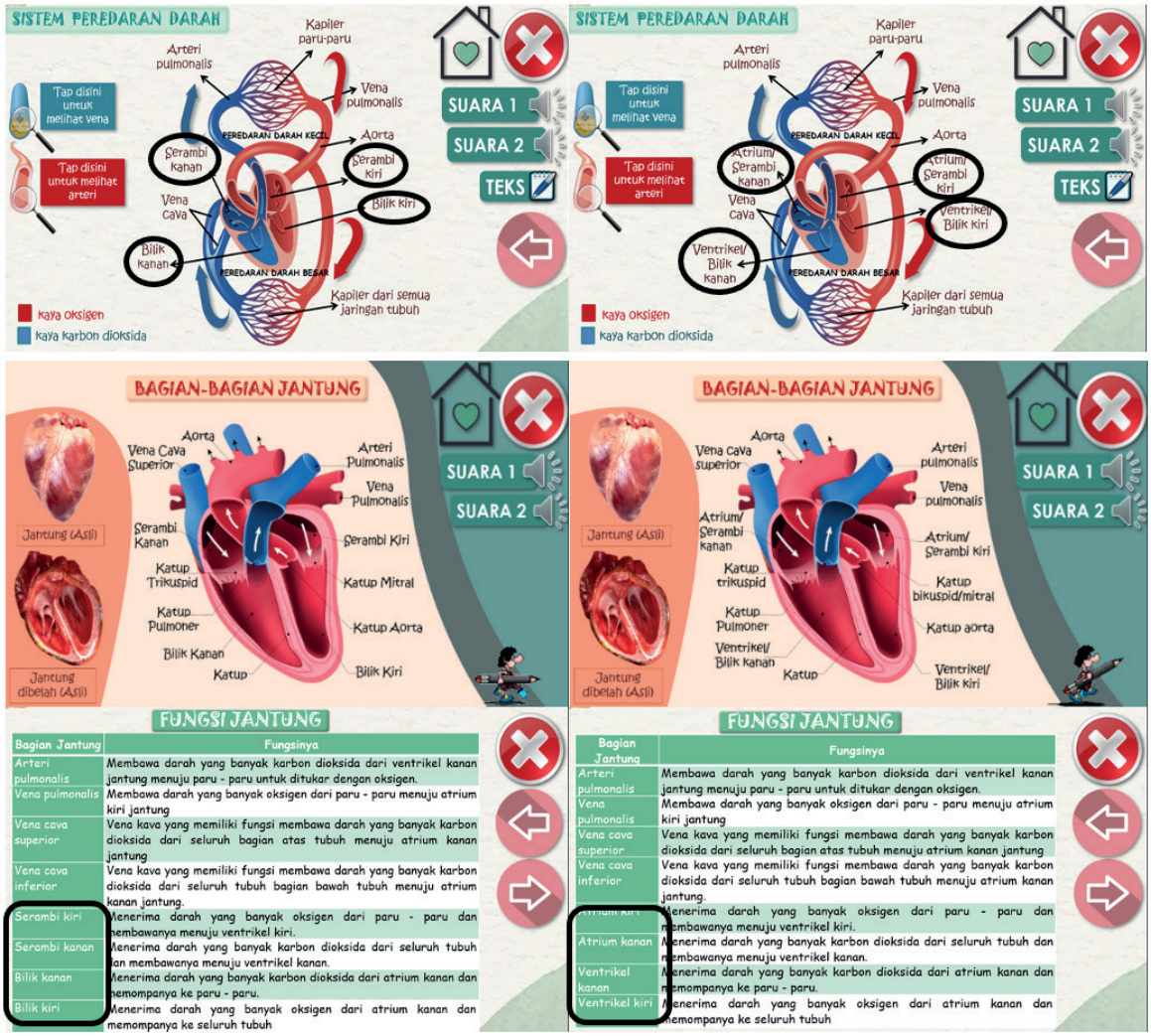

Figure 8. Improved Use of Scientific Words in Image Captions

The left image shows the pages in the e-module before repair, while the right shows the pages after being repaired based on the advice of material experts. Substitute lay language with scientific language or medical terms in e-modules because learners will continue to remember the language/knowledge that was first known until adulthood (Hurlock, 2002). It align with what Piaget said: students will accommodate the knowledge gained (Champion, 2019), then use it in everyday life until it reaches the adult level of knowledge will stick forever (Santrock, 2019).

The use of medical language in e-modules is more appropriate because it follows international standards, besides assuming that if students are introduced to medical terms from an early age, then children will use language accurately in everyday life. This is because elementary school-age children are more accessible to remember, like sponges that readily absorb the material delivered (Solso et al., 2014). The findings support this statement (Wood et al., 2006) that the earlier the topic is given, the easier it will be for students to understand and absorb the material presented. Furthermore, students will use language based on vocabulary mastered in daily communication (Mardison, 2016). The layman's terms in the book remain in the e-module and are not omitted. This is to clarify the difference further and to expand their knowledge.

Further suggestions for adding material about the duration and frequency of exercise, how to calculate an average heart rate when exercising, and the causes of narrowing of blood vessels. Improvements to such suggestions are presented in Figures 9 and 10.

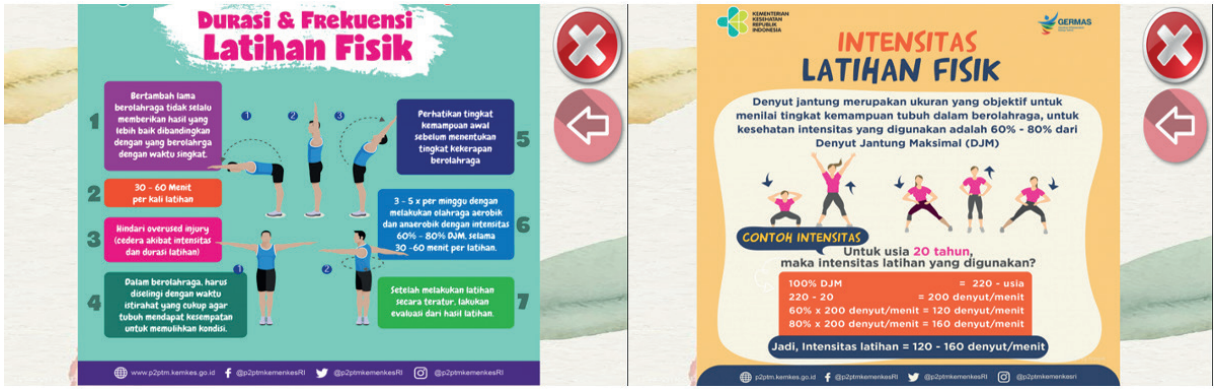

Figure 9. Additional Material Frequency and Intensity of Physical Exercise

Figure 10. Additional Material Causes Narrowing of Blood Vessels

The purpose of adding the material is to provide information so that students know how much time they need to exercise. Through this material, students were also given provisions to calculate their heart rate after exercise so that they will be able to check whether their heart rate is at average frequency. The addition of material about the causes of the narrowing of blood vessels aimed to make students understand the dangers of plaque in blood vessels, especially in the heart, which can eventually cause various diseases in the body. Blockage of blood vessels will cause many diseases such as stroke, coronary heart disease, atherosclerosis, and various other diseases that are one of the causes of death (Kumar et al., 2020; Lina & Saraswati, 2020; Spaziani et al., 2021). Plaque, a trigger factor for heart attack symptoms, is one of the first causes of death in the world (Desky, 2021; Kanna & Eliyas, 2023; Spaziani et al., 2021). After having this knowledge, they will pay more attention to their health and apply a healthy lifestyle. This is supported by the statement by Azzahrah Putri et al. (2021) that students receive the earlier knowledge, the easier they will be to habituate the knowledge acquired.

Improvements from Media Expert Validation

Based on the media experts' (constructs) assessment, several suggestions were obtained for improving the e-module. Improvements are made so that the developed product becomes an interesting learning module and more suitable for use. It align with what was conveyed by Violadini & Mustika (2021) that the modules that have been developed need to be improved to obtain feasibility so that product quality is better and feasible to be delivered to students so that they are more motivated to learn. Suggestions for improvements were made to improve the product so that the product can used as teaching material in supporting the learning process to achieve learning objectives (Sari & Wardani, 2021). The suggestions for improvement from several media validators were to improve the quiz background to make it more contrasting, the selection of fonts that are more attractive for elementary school students, and the font size to be made more prominent. Such improvements are presented in Figures 11 and 12.

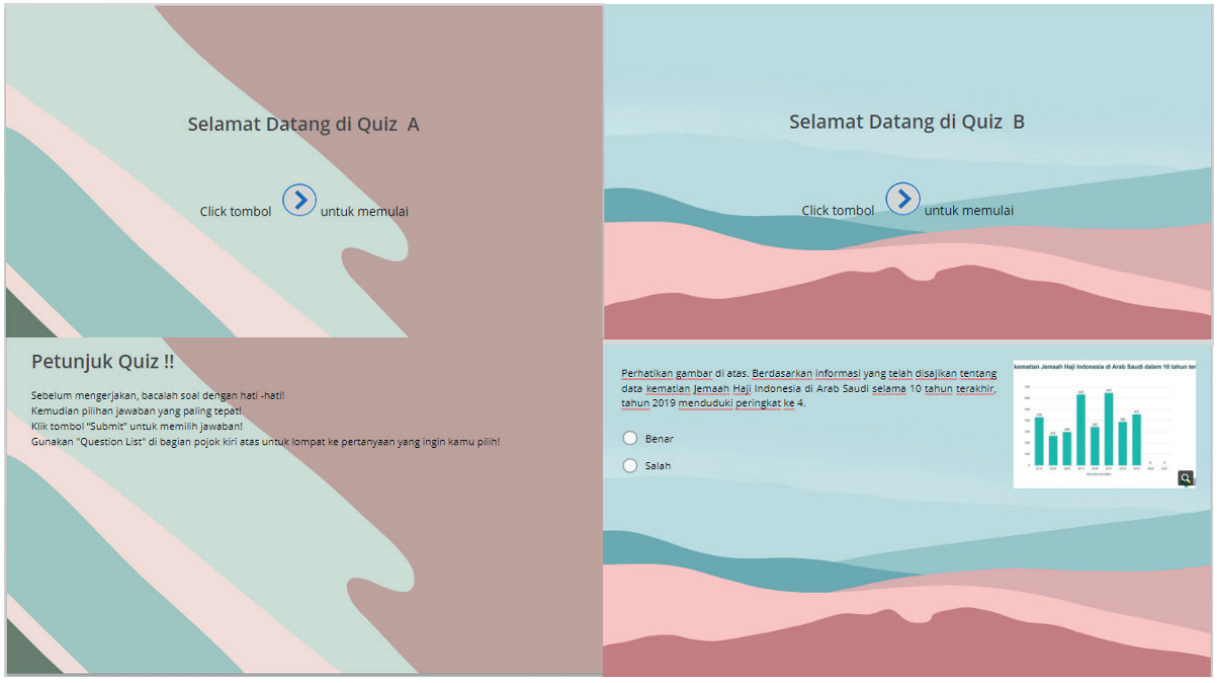

Figure 11. Quiz Display Before Fixing

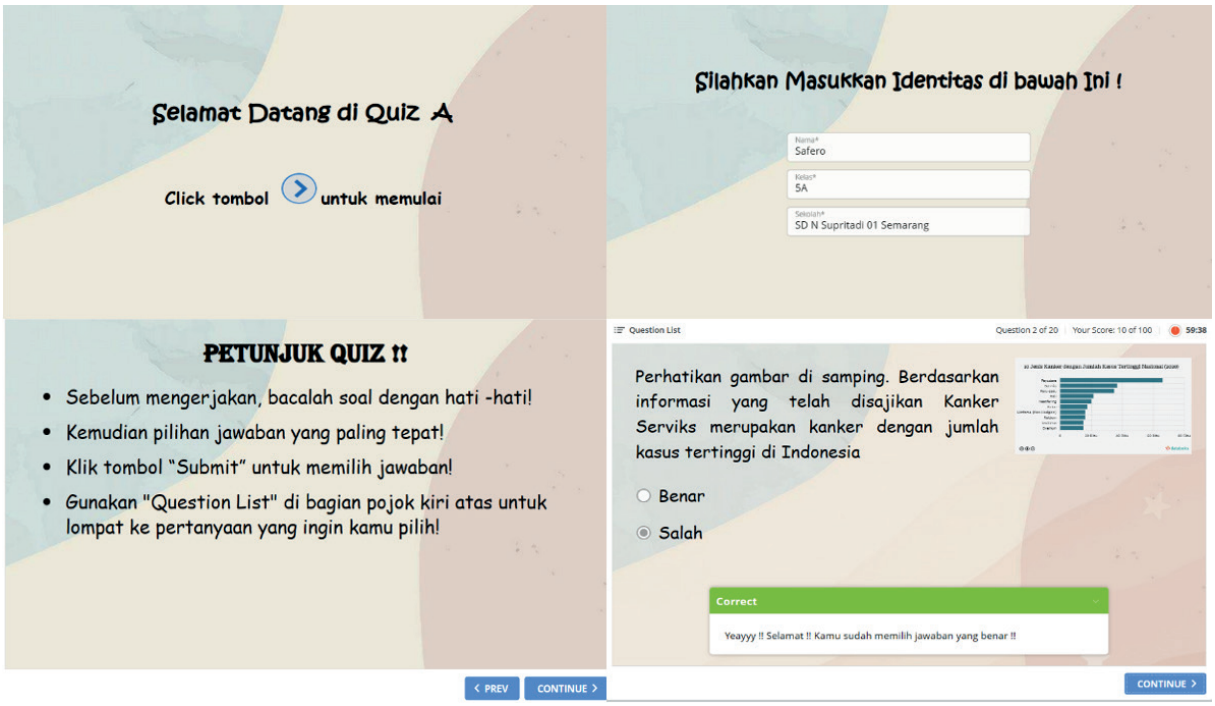

Figure 12. Sequizi (quiz) display after fixing

Improvements to the background display were made more contrasting and aesthetically pleasing so students feel comfortable visually when working on problems. It also contained aesthetic elements that beautified the appearance, making it looked attractive so students felt comfortable working. It was also conveyed by Nadori & Hoyi (2021) that displaying attractive e-modules will foster students' interest in learning. Font fonts were made beautiful so that letters look more attractive and do not seem formal like fonts in books. Font Size was made larger so that the questions are instructions for working on the questions and read more clearly so that students are more comfortable when reading.

Suggestions for further media aspect improvements are on the video reference page to directly link the reference page to the video link address provided. It aimed to students can immediately explore the reference page listed on the website provided. The goal is to appreciate the work of the video creator and avoid plagiarism. The improvements to the video reference page are presented in Figure 13.

Figure 13. Video Reference Page Improvements

Figure 13 shows the fix on the video reference page. The image on the left shows the page before it was repaired. The image on the right shows the link to the video reference. If in "tap," it will directly connect to the video creator's YouTube page. After improvements were made from the media aspect, Prisma e-modules are increasingly suitable for use because of the increasingly attractive appearance and appropriate illustrations representing the material presented. It aligns with what Kurniasari et al. (2018) conveyed: the learning e-module must meet interesting criteria and contain illustrations that captivate users to motivate them to learn (Widiastuti, 2021). Wulansari et al. (2018) said that the images and graphics used in the e-module should represent and explain the learning topic so that learners are readily receptive to the information presented.

Improvements from Linguist Validation

Suggestions from validation linguists to correct the "Preface." The introduction should be intended for students rather than for supervisors. It is because the preface is designed for readers; in this study, the target is students who will use the PrismA e-module. The improvements are presented in Figure 14.

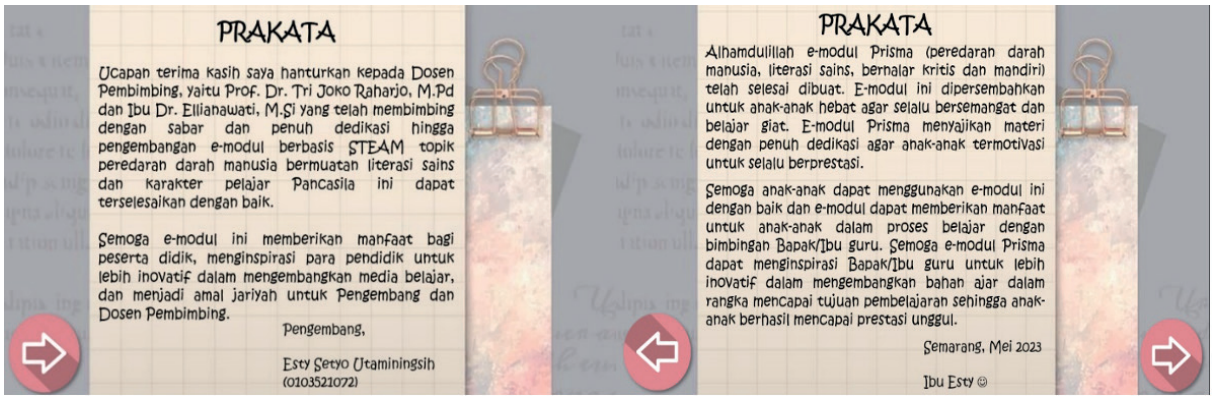

Figure 14. Preface Pages Before and After Fixing

The next suggestion is that "The "Warning" page should use more friendly language, such as call-to-action and not command sentences, so children feel safe when reading them." The improvements to the "Warning" page are presented in Figure 15.

Figure 15. Warning Page Before Fixing

Linguists also suggest removing animations on vein pages because they can interfere with students' focus. It is because the images on the page are full, so animations or moving images can interfere with the focus on the material. Students are feared to be more focused on moving images compared to material images. Improvements to such suggestions are presented in Figure 16.

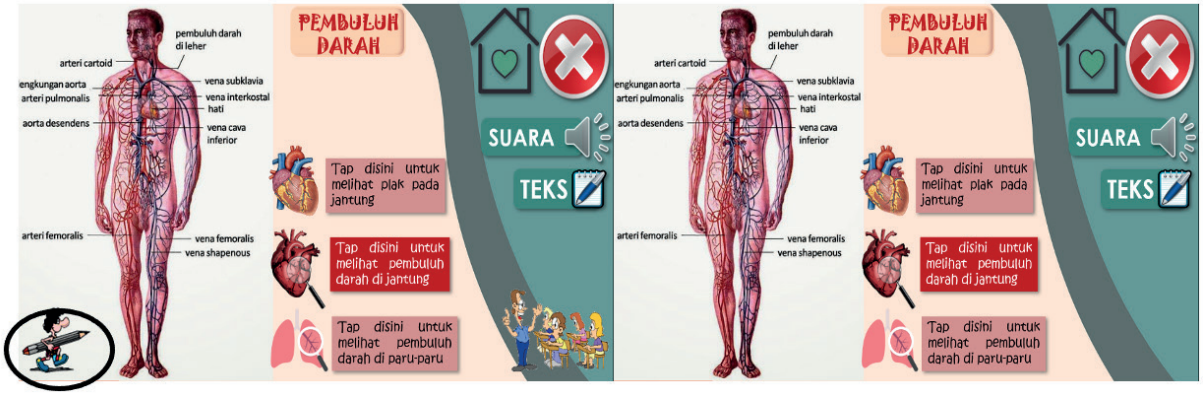

Figure 16. Blood Vessel Page Before and After Repair

Practicality Test Assessment Results

The next step after the product was declared valid and suitable for use in the learning process was to test the practicality of the product. The practicality test of the e-module was tested on grade V educators and grade V students of Supriyadi Elementary School Semarang. Small group tests were generally conducted for students already receiving research topic material. Of course, fifth graders meet these requirements because they have received material about the human circulatory system in semester I. However, they cannot be said to have mastered the concept. A practicality or small-scale test was conducted to see to what extent the Prisma e-module can be used to achieve learning objectives. The results of the practicality test for fifteen students of Supriyadi Elementary School Semarang are presented in Table 14.

Table 14. Results of the Prisma E-Module Practicality Test on Students

Number	Aspects	The Number of Grains	The sum of each aspect's scores
1	Effectiveness	3	163
2	Efficiency	3	157
3	Creativeness	3	143
4	Readability	3	156
5	Interactive	3	159
	Total Amount of Earnings		778
	Maximum Number of Scores		900
	Percentage		86%
	Practicality Level Criteria		Very Practical

Table 14 shows that the practicality test of the e-module is measured in terms of students getting a score of 778 or a percentage of 86%. It can be concluded that Prisma's e-modules are in the "convenient" category. This is in line with the results of the research by Suryati et al. (2022) that the e-modules developed are declared practical with a percentage of 90%, which has the criterion of practicality "outstanding." Based on these results, according to learners, the developed device has an excellent degree of practicality. The finding of Nurhasanah also support the study's results; the e-module designed has a practicality percentage of 90.26%, which is in the "convenient" category. Accraf et al. (2019) Also found something similar: the results of practicality tests on students showed a percentage of 85%, so the products developed were "efficient." E-module developed by Widiastuti (2021) also obtained very high practicality test results with a percentage of 92.6%. Hence, the e-module is interesting for students to used in the learning process.

The practicality assessment of the e-module is obtained from students and carried out to grade V educators of Supriyadi Elementary School Semarang. The results of the practicality test for educators are presented in Table 15.

Table 15. Results of the Prisma E-Module Practicality Test for Educators

Number	Aspects	The Number of Grains	Number of Scores Every Aspect
1	Cover Page	4	20
2	Clarity of Tables/ Illustrations/ Figures	4	20
3	Language and Sentences	4	20
4	Clarity of Writing	4	20
5	Color Composition	4	20
6	Module Content	4	17
7	Motivating to Respond to Learning	4	18
	Total Amount of Earnings		135
	Maximum Number of Scores		140
	Percentage		96%
	Practicality Level Criteria		Very Practical

Based on Table 15 regarding the results of the Prisma e-module practicality test to educators, it can be concluded that the e-module obtained a score of 132 with a percentage of 96% and was in the level of practicality "very practical." Similar findings are also contained in the results of the study by Raharjo et al. (2017) that the e-module practicality test developed from the educator's assessment is practical with a percentage of 90%. This is also supported by the results of research by Accraf et al. (2019) that the practicality test of educators on the developed product has the criterion of "very practical."

In a practical assessment by educators, there are several suggestions for improvement, namely, on some audio so that the sound is louder, and the audio has been improved. The following request is to add pictures and explanations on the Sphygmomanometer page. Improvements to such suggestions are presented in Figure 17.

Figure 17. Sphygmomanometer Page Before and After Repair

Figure 17 shows the page of the Sphygmomanometer before and after repair. In addition to the above improvements, educators also provide input related to technical use. According to educators, using e-modules should be accompanied by control and direction from developers (teachers) during the learning process, so that learning can continue by the learning implementation plan and objectives. It means that educators must monitor the use of e-modules in elementary schools because students still need guidance in the learning process with new things. Advice from educators can make it easier for students to use Prisma e-modules. In addition, it expected to have promising implications for learning outcomes. It align with this statement, Aini (2019) conveys that educators have an essential role in the learning process, namely improving student learning outcomes. Based the practicality test day in Table 14 and Table 15, both aspects of the practicality assessment of students and educators are in the "very practical" criteria. It can be concluded that the developed product can be continued to the large-scale test stage. The e-module is suitable for use in the learning process to deliver human circulatory material.

CONCLUSION

The developed e-modules train critical reasoning characters and independent characters. The Rambu menu (learning summary for you) and the Vijar menu (learning videos) guide and teach all elements of critical reasoning and independent character by the provisions of the Pancasila Student Profile to shape the nation's character because the content is more detailed and equipped with a microscopic description of the process flow. The Sequizi menu, a comprehensive collection of core quizzes, is employed to engage students and gather feedback on their learning outcomes, thereby facilitating the assessment and enhancement of students' Pancasila character development. Prisma E-Modules have been feasibility-tested by experts based on content, construction, and language aspects. Judging from the aspect of Prisma e-module content, it is declared "valid" with a value of V Aiken 0.9615. When viewed from the constructed aspect, it is stated "valid" with a value of V Aiken 0.9469, and the Language aspect is declared "valid" with a value of V Aiken 0.9219. Overall, aspects of Prisma's e-module were declared "valid" with an Aiken V value of 0.942. Prisma's e-module received a practicality test score of 86% from students and 96% from educators. Suggestions for further research can develop applications that can be accessed by devices with Android and iOS programming bases so that all students can install applications developed on their respective devices. This research aims to improve the character of Pancasila students in the dimensions of critical and independent reasoning; further research can develop e-modules containing six dimensions of Pancasila student character.

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